



Armed Forces College Of medicine AFCM

Good Morning..

*Be happy
Do the best you can
Be good and kind*

God Bless..



Pathology of endocarditis

Prof. Eman Abdelbary

Intended Learning Objectives (ILOs)



By the end of this lecture the student will be able to:

1. Identify the aetiology, complications of endocarditis
2. Summarize the pathogenesis and pathological features of endocarditis
3. Differentiate between pathological and clinical features and prognosis of endocarditis

Lecture plan



1. Part 1 (15 min): Pathology of acute infective endocarditis.
2. Part 2 (20 min): Pathology of subacute infective endocarditis.
3. Part 3 (5 min): Examples of non infective endocarditis
4. Lecture Quiz (5 min)

Endocarditis



Definition:

Inflammation of the **valvular (\pm mural)** endocardium



Types

:

Infective

Noninfective

1- Acute

2- Subacute

1- Rheumatic

2- Libman-Sacks

3- Non bacterial
thrombotic

Infective Endocarditis



- Classified into acute and subacute based on *the tempo* and *severity* of the clinical course, *virulence of the microbe* and *underlying cardiac disease*.

- A clear differentiation between acute and subacute endocarditis is not always possible
Clinical features:

- **Non specific symptoms: Slight fever, fatigue, loss of weight, flu-like symptoms (in SABE)**
- **Rapidly developing high grade fever, chills, weakness and manifestations of septicemia (in ABE)**

Acute Infective Endocarditis



Definition: Acute suppurative inflammation affecting cardiac valves (either healthy or diseased).

Causative organisms: highly virulent organisms e.g. hemolytic streptococci, staphylococci & gonococci

- Organisms reach the blood (**septicemia**) in case of severe infection (puerperal sepsis, IV drug abusers, genitourinary, skin, periodontal infection ...)

Acute Infective Endocarditis



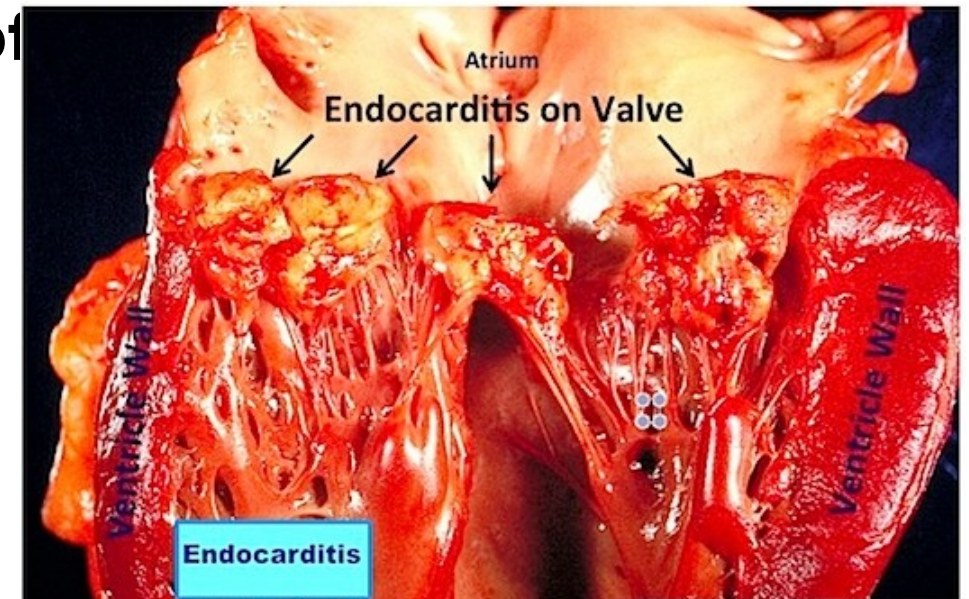
Pathogenesis:

Septicemia + healthy/ diseased valve

bacteria on valve surface & invade it
perforation

multiplication of
suppuration,

destruction of



Acute Infective Endocarditis



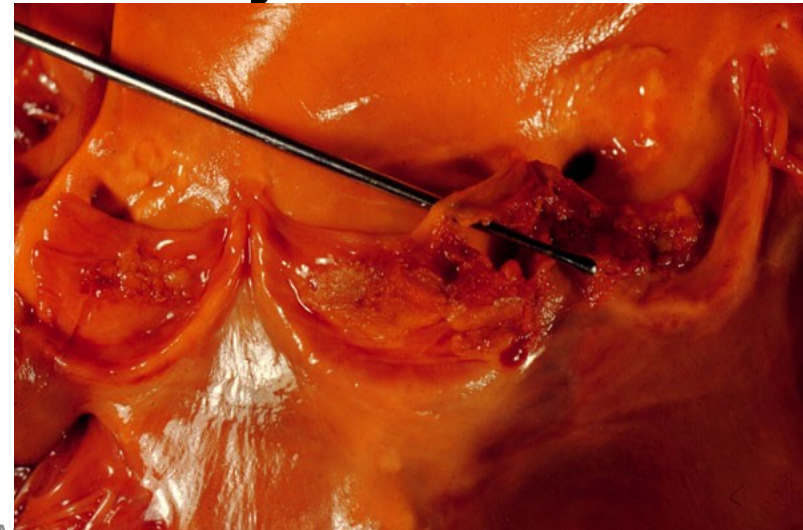
Pathological features:

1- Valve lesions: **Mitral & aortic** are most commonly affected,

Tricuspid is affected in IV drug abusers

Mural endocardium may be affected

inflammation



New Five Years Program

https://thoracickey.com/wp-content/uploads/2016/06/m_hurs13_c086f003.jpeg

(Cardio-Pulmonary Module)

http://2.bp.blogspot.com/_OwoEg7D6_AE/TS5U6iEfQ-I/AAAAAAAAABdA/PPeGxzx_j2c/s1600/Aortic%2Bvalve%2Bacute%2Bendocarditis.png

Acute Infective Endocarditis



Pathological features:

1- Valve lesions:

▪ **Vegetations:**

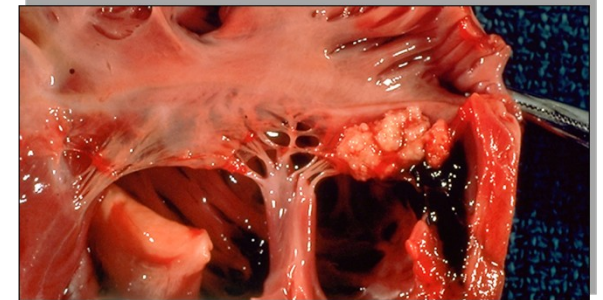
Grossly: Multiple, bulky, yellowish gray, friable, detachable, developing anywhere on the cusps.

- May erode the underlying myocardium
ring abscess

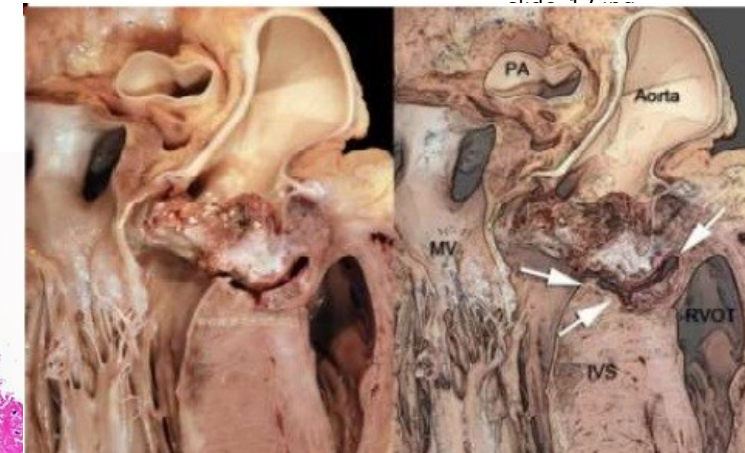
Microscopically: Vegetations composed of
platelets + fibrin + bacteria + neutrophils

New Five Years Program

(Cardio Pulmonary Medicine)



<https://images.slideplayer.com/39/10887972/slides/>



%2Fcsbrprasad%2Fcv-
iecsbrp&psig=AOvVaw2joOuDWkn46kAypFpwwxC&ust=1596703219124000
&source=images&cd=vfe&ved=0CAIQRxqFwoTKIwusbfHg-
sCFQAAAAAdAAAAABAT

Acute Infective Endocarditis



Pathological features: Cont.

2- Myocardial lesions: Severe degenerative changes and ring abscess

3- Embolic lesions: Systemic pyemia, pyemic abscesses

Janeway lesions: painless, red lesions on the palms and soles (due to septic microemboli)

4- Toxic lesions: severe toxemia



Diagnosis: Blood culture

New Five Years Program

(Cardio-Pulmonary Module)

http://2.bp.blogspot.com/-_ieGlvmskbQ/UDh3zEt1PaI/AAAAAAAAAEk0/HPNQgaiac-Y/s1600/osler_s_node.jpg

Prognosis: Rapidly fatal (toxemia & organ perforation)

Acute infective endocarditis (Quiz)



What is the cause of endocarditis with severely destroyed aortic valve cusps with attached friable vegetations?

- A. Streptococcus viridans
- B. Streptococcus fecalis
- C. Staphylococcus aureus
- D. Hemophilus influenza
- E. Systemic lupus erythematosus



Acute infective endocarditis (Quiz)

What is the cause of endocarditis with severely destroyed aortic valve cusps with attached friable vegetations?

- A. Streptococcus viridans
- B. Streptococcus fecalis
- C. Staphylococcus aureus**
- D. Hemophilus influenza
- E. Systemic lupus erythematosus

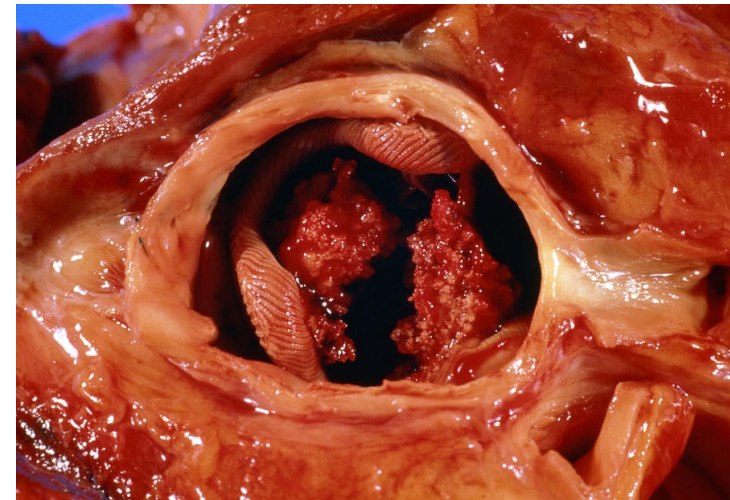
Subacute Infective Endocarditis



Definition: Subacute inflammation affecting ***diseased valves.***

Predisposing factors:

- 1. Congenital heart disease**
- 2. Rheumatic valvulitis**
- 3. Artificial valves**



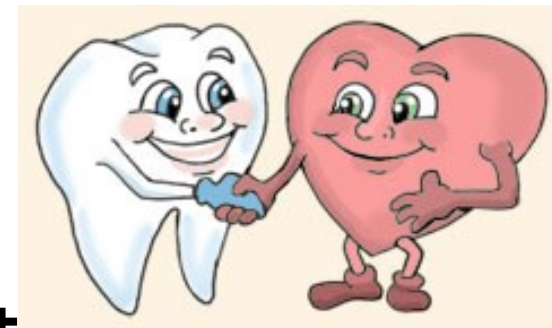
<https://images.fineartamerica.com/images-medium-large/artificial-heart-valve-showing-bacterial-infection-dr-e-walker.jpg>

Subacute Infective Endocarditis



Causative organisms: Low virulence organisms e.g. strept. Viridans.

Pathogenesis:



Diseased valve (rough surface & low vitanity,
+ Bacteremia (e.g. throat commensals during tooth
extraction, tonsillectomy.....)



Multiplication of bacteria on diseased valve

Subacute Infective Endocarditis

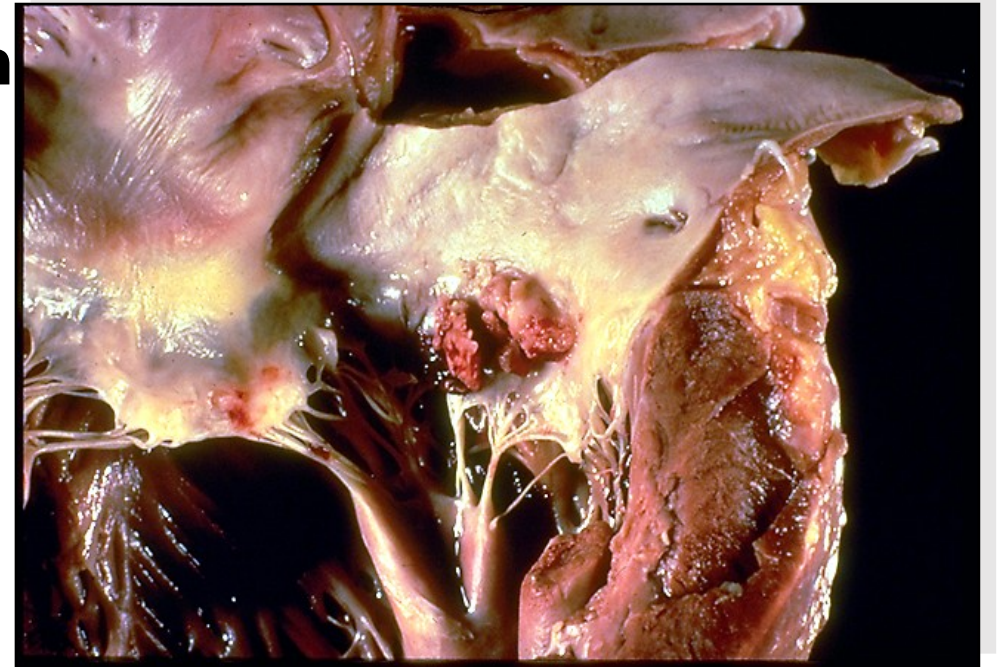


Pathological features:

1- Valve lesions:

Mitral & aortic are most commonly affected,

Also mural endocardium (e.g. MacCallum patch):



Subacute Infective Endocarditis



Pathological features:

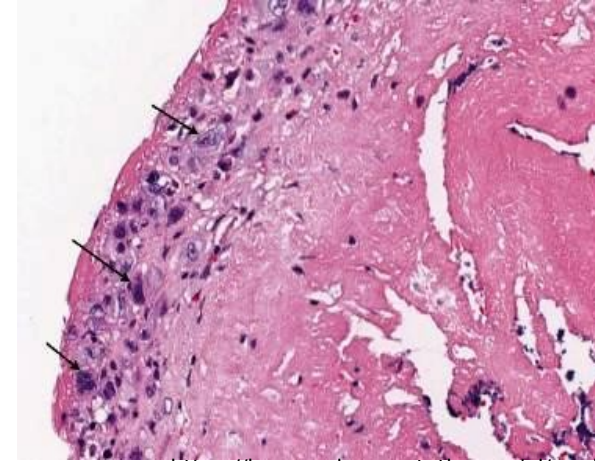
1- Valve lesions:

- **Picture of the original disease**

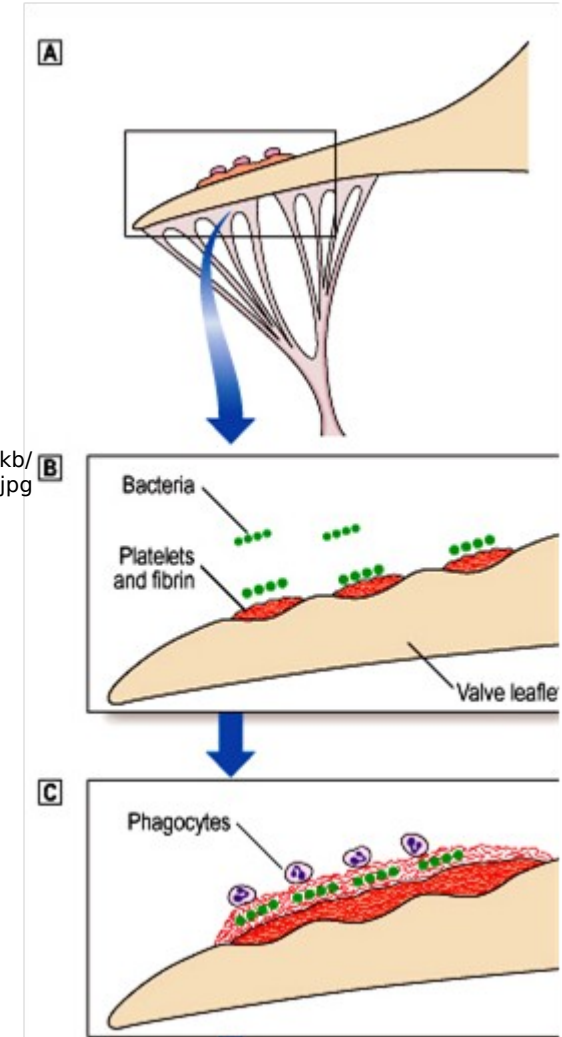
- **Vegetations:**

Grossly: Multiple, large, gray, friable, detachable, developing anywhere on the cusps & MacCallum's patch.

Microscopically: Vegetations consist of platelets + fibrin + bacteria + inflammatory cells (histiocytes)



<https://img.medscapestatic.com/pi/meds/ckb/25/12825tn.jpg>



Subacute Infective Endocarditis



Pathological features: Cont.

2- Myocardial lesions: Degenerative changes

3- Embolic lesions: No pyemia:

- **Kidney, spleen, brain,...etc: infarction**
- **Retina (Roth spots): blindness**
- **Coronary embolism**

Subacute Infective Endocarditis



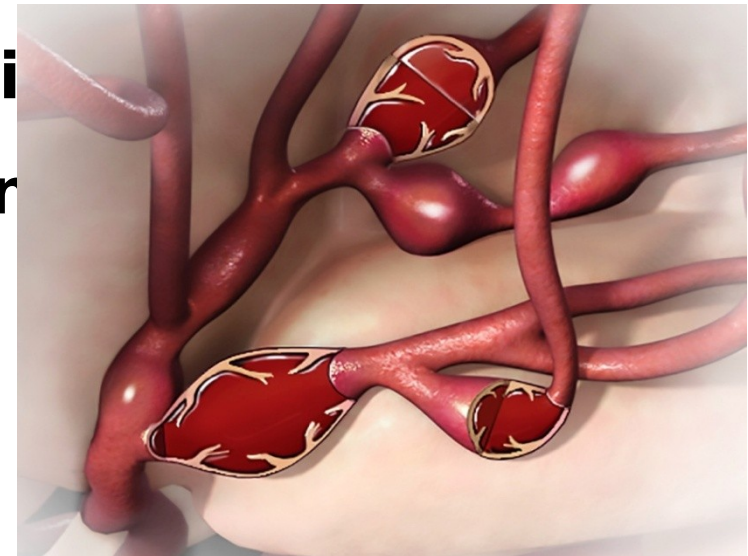
Pathological features: Cont.

3- Embolic lesions:

➤ **Mycotic aneurysm: most common in cerebral & mesenteric arteries**

**impacted embolus
fibrosis (weakening)**

**mild inflammation
dilatation**



Subacute Infective Endocarditis



Pathological features: Cont.

4- Toxic lesions: Moderate toxemia

- ❖ Fever, anemia
- ❖ Splenomegaly
- ❖ Liver & renal degeneration
- ❖ **Petechial hemorrhage**



<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQVSGhUHcqDjciIzaAV30zwDiw0myb-VNkAxQtT2ZY20yeyhNjy>

Subacute Infective Endocarditis



Pathological features: Cont.

4- Toxic lesions: in the extremities:

➤ **Osler's nodules:** small tender nodules in pulps of fingers & toes (due to immune complex deposition with capillary damage & perivascular infiltrate)

➤ **Splinter fingernail hemorrhages** (due to capillaritis)



<https://westjem.com/wp-content/uploads/2013/01/6806-f1.jpg>



<https://www.aafp.org/afp/2010/0601/afp20100601p1375-f1.jpg>

Subacute Infective Endocarditis



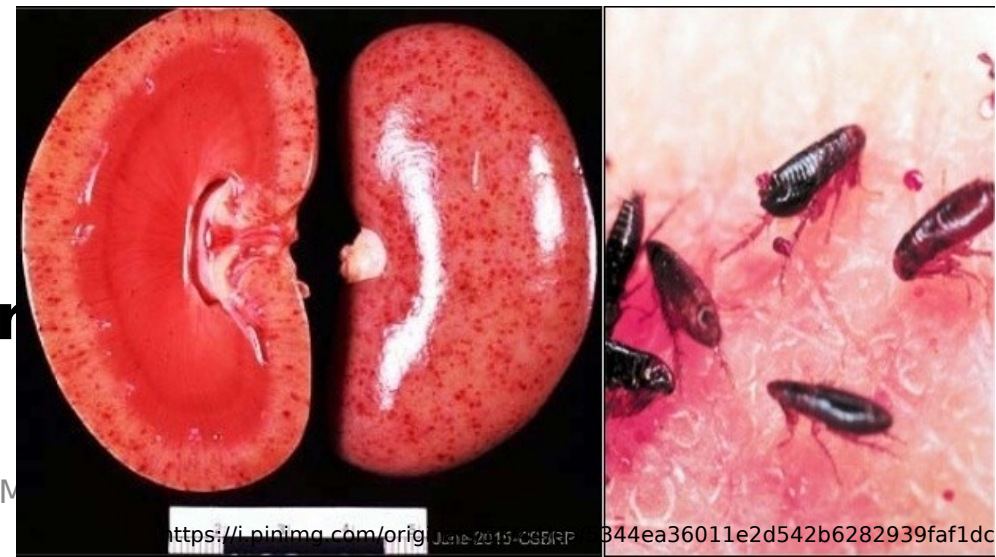
Pathological features: Cont.

4- Toxic lesions: Moderate toxemia:

❖ **Focal glomerulonephritis: due to antibodies to bacterial antigens** → **Immune complexes deposition** → **toxic capillaritis** → **focal glomerular necrosis & inflammation**
petechial hemorrhages

(flea bitten kidney)

Clinically: Hematuria & renal failure



Subacute Infective Endocarditis



Prognosis:

- **Usually treatable (most cases)**
- **Valve healing → stenosis or incompetence → heart failure**

Acute Vs. Subacute Infective Endocarditis



Subacute	Acute	
> 6 Ws	>6 Ws	Duration
Strept. viridans	Staph. Aureus, B-strept.	Most common organism
Low	High	Organism virulence
Damaged	Normal/ diseased	Previous Valve condition
Not invasive or suppurative	Invasive, destructive, suppurative	Valve lesion
Splenomegaly, petechiae	Acute Septicemia	Clinical features
Usually treatable	Usually fatal	Prognosis



Subacute infective endocarditis (Quiz)

A 64-year-old man, with a past history of rheumatic heart disease, presented to the emergency room with high fever, fatigue, and difficulty in breathing. Tonsillectomy was done few weeks before admission. Physical examination revealed a small tender nodule in the pulp of the index finger. What is the pathological feature seen in his condition?

- A. The tricuspid valve is severely destroyed.
- B. The kidneys show multiple pyaemic abscesses.
- C. The skin of the patient show petechial hemorrhage
- D. A large defect in the interventricular septum
- E. The myocardium shows ring abscess

Subacute infective endocarditis (Quiz)



A 64-year-old man, with a past history of rheumatic heart disease, presented to the emergency room with high fever, fatigue, and difficulty in breathing. Tonsillectomy was done few weeks before admission. Physical examination revealed a small tender nodule in the pulp of the index finger. What is the pathological feature seen in his condition?

- A. The tricuspid valve is severely destroyed.
- B. The kidneys show multiple pyaemic abscesses.
- C. The skin of the patient show petechial hemorrhage**
- D. A large defect in the interventricular septum
- E. The myocardium shows ring abscess

Non-infective Endocarditis



- Small, sterile, non-destructive vegetations
- Increased risk of embolism & subacute infective

endocarditis
**Libman-Sacks
endocarditis**



**Immune complex mediated
valvulitis associated with SLE &
antiphospholipid antibody
syndrome**

**Non bacterial
thrombotic
endocarditis**



- **Occurs with hypercoagulability
states, chronic debilitating
diseases (cancer , uremia) and
cardiac catheterization**

Differences between vegetation



Subacute infective endocarditis	Acute infective endocarditis	Rheumatic	
Cusps surfaces & mural endocardium	Cusps surfaces & mural endocardium	Line of closure of cusps	Site
Large	Large	Small	Size
Friable	Friable	Firm	Consistency
Loose	Loose	Firm	Attachment
Brown or green	Yellow	Gray white	Color
Absent/ present	Present	Absent	PNLs
Low virulence	High virulence	Absent	Bacteria
Infected	Septic	Absent	Emboli



Non-infective endocarditis (Quiz)

Write true or false:

- Libman-sacks endocarditis is common in patients with uremia **False**
- Non infective endocarditis is associated with increased risk of embolization **True**

Key points



- Endocarditis is **Inflammation of the valvular (\pm mural) endocardium**
- **Acute infective endocarditis is acute suppurative inflammation affecting healthy valves, caused by highly virulent bacteria**
- **Vegetations of acute infective endocarditis are Multiple, bulky, yellowish gray, friable, detachable, developing anywhere on the cusps, rich in neutrophils**
- **Subacute infective endocarditis is subacute inflammation affecting diseased valves, caused by low virulence organisms, leading to cardiac vegetations, embolic and toxic manifestations**
- **Vegetations of subacute infective endocarditis are multiple, large, gray, friable, detachable, rich in histiocytes**
- **Non infective endocarditis is characterized by Small sterile vegetations**

Suggested Textbooks



1. Mitchell R. Blood vessels. In Robbins and Cotran pathologic basis of disease, 9th edition. Kumar, Abbas & Aster (eds). Elsevier Saunders. Pages 487 to 491.
2. Cardiac pathology. In USMLE step 1 lecture notes, 2017. Kaplan INC, New York. Pages 112 -125

